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On the Use of Variable User Goals to Measure Perceived Usefulness

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Abstract

The usefulness of an information system depends on the goal that the user is trying to achieve with the system. Yet current user acceptance models treat user goals as static and not changeable. If different users have different goals for the same system, this may lead to inconsistent and unreliable assessments of perceived usefulness and information system acceptance. In our research, we demonstrate by an empirical study that perceived usefulness varies depending on the goals users have with the same system. We contribute with our work to the enrichment of user acceptance models by introducing the concept of layered user goals and an increasingly consistent measure of perceived usefulness.

Keywords: Technology Acceptance Model, Perceived Usefulness, User Goals, Means-End-Chain.

1 INTRODUCTION

Across many different user acceptance models, the concept of perceived usefulness has consistently been a strong determinant and a fundamental driver of user acceptance. The Technology Acceptance Model (Davis 1989, Davis et al. 1989), for example, treats it as a pivotal construct in explaining why users intend to use technology. Similar notions of usefulness have been formulated in general theories of adoption (relative advantage, Rogers 2003), and a unified theory of user acceptance of technology (performance expectancy, Venkatesh et al. 2003).

Perceived usefulness implies that the system in question provides utilitarian value (Trice et al. 1988). Accordingly, the user views the information system as a means to an end, or in other words: as an instrument to fulfil a goal external to the user-system interaction. The goal of the user is the end state that he or she wants to achieve after using the information system.

User goals and perceived usefulness are therefore by implication strongly correlated. If the goals of the users vary, so will the perceived usefulness of the instrument (i.e. the information system). If the user goal varies, the utilitarian value of an instrument also varies. For example, an online bookstore is useful if a person aims to browse or buy books, but much less useful if this is not what that person aims to do.

We would therefore expect user acceptance models to pay significant attention to the goals of the user. Unfortunately, the attention paid to user goals in the current conceptualisations of user acceptance is rather limited. One reason why this appears may be the relatively narrow context in which the user acceptance models have been developed. Davis (1989), for example, developed the Technology Acceptance Model specifically for work environments. In an office context, the goal of an information system is to increase a user's task performance. This goal is reasonably undisputed and therefore treated as a constant in the model. Problems arise when the user acceptance models are taken away from the office context, and applied to other contexts. For example, the user goals of hedonic information systems and electronic commerce applications are very different from, and sometimes much less obvious than, the traditional office information systems. If these goals are not made explicit, the users will 'invent' their own goals as they assess perceived usefulness. Consequently, it will be difficult to compare their assessments because the users can have different goals for the same system.

The different goals can either vary in their contents or they are different because they target the same goal only at different abstraction levels. Take for example integrated enterprise information systems. These systems fulfil a variety of user goals for a variety of users. Users may individually use these integrated systems for different goals, and it then becomes increasingly awkward to compare their usefulness assessments. Understanding the goals of users is therefore a matter of entangling two unknowns: first, to know what a user aims to do, and second, to identify how abstract these goals are.

In this research project, we are trying to address these concerns by introducing variable user goals. By equipping user acceptance models with flexible ways to include user goals, the models are becoming more applicable beyond the office context, for example, in the realm of hedonic information systems, and electronic market applications. They will also then become applicable to large, integrated systems that fulfil many different user goals for many different stakeholders.

The paper presents the results of a focus group study, which assesses the goals of users while using an advanced information system and measures their perceived usefulness for that system. The paper has two objectives. The first objective is the integration of user goals into user acceptance models. Therefore, we analysis perceived usefulness and its treatment of user goals especially in fields of organizational behavior and software engineering. Of direct relevance are the goal hierarchies as applied by Gutman (1997) for consumer goals, by Chmura and Crockett (1995) for information system alignment and by Cockburn (2000) for primary users of information systems using use cases.

The second objective of the research is the empirical driven development of a hierarchy of goals and the measurement of perceived usefulness for the goals. The current scale of the HED/UT model provides items to measure perceived usefulness and we apply these measures to an electronic commerce application.

The paper is structures as follows. Section 2 discusses user goals and different representation schemas. Section 3 introduces the empirical research. In section 4, the results are presented in form of the description of the user goal hierarchy and the outcomes of the perceived usefulness measurement. Section 5 discusses our findings and summaries contributions, limitations, and future research.

2 THEORY

Goals have long been an object of study in motivational and organisational behavioural research. This is not surprising as they are considered to be the immediate regulators of human behaviour (Erez et al. 1985). They form a framework for action and reaction to situations or effects (Button et al. 1996). For example, the expectancy-value theory postulates that human behaviour (the decision to act in a certain way) depends on the human expectancy that action will lead to a special output value. It follows then that people frame their goals as end states of their aims (Erez and Kanfer 1983). In this perspective, goals represent either the attainment of desirable, pleasant consequences or the avoidance of unpleasant consequences (Winell 1987).

In the business and management literature, goals are related to the various roles a person can assume; for example, being a consumer, supplier, or an employee. What the goals for these roles have in common is that we can characterise them by three attributes (Keeney, 1994): the decision context, an objective, and a direction of preferences. For example, a goal of implementing mobile applications in a company is to "maximise customer satisfaction" (Nah et al. 2005). The decision context is influencing sales and profit numbers, the objective is customer impact and the direction of preferences is to have a higher impact rather than less. These three attributes are one reason why goals are difficult to capture. Another reason is the inherent nature of goals to be connected with each other, which results in a high level of complexity of goals.

Techniques such as Means-End-Chains (MEC) and goal hierarchies are developed to facilitate our understanding of a person's goals. All these approaches are similar in that they investigate goals on different levels which allow a clearer structure, deeper understanding, and a substantial basis for research (Keeney 1994). In hierarchies lower-level goals are subordinated to higher-level goals. Low-level goals are labelled as sub-goals and higher-level goals as super-goals (Gutman 1997). Goal hierarchies are used to break up a complex, long-range decision into a sequence of simple, short-range problems which are easier for the users to manage. Goal hierarchies are beneficial because they reflect the user's ideas and reasons for action.

Gutman (1997) emphasises the difference between goals and values: goals express what we want and values express why we want them. Attributes, consequences, and values are the three elements of traditional means-end chains: models that seek to explain how the decision for a product or service impacts the achievement of a desired end-state (Gutman 1982). Attributes are the characteristics of the product or the system. Consequences are the effects on users caused by the attributes. Finally, values are the persons' beliefs or perception of the outcomes whilst using or consuming products (Reynolds and Gutman 1988). The three MEC elements are interconnected in the way that lower levels are a means to achieve higher levels to finalise an overall end state (Mort and Rose 2004). Although values are defined as "desirable end-states of existence" (Gutman 1982) this top level state is not designed to be consciously experienced by the users (Claeys et al. 1995).

An interesting parallel to user goal hierarchies is to be found in the software engineering literature. A well-known concept in developing system requirements is the use case technique. Use cases define what a user hopes to achieve by using a system in one specific case. A popular way to express use

cases is by drawing them as a hierarchy of user goals (Cockburn 2000). Goals are considered to be a key element of use cases, as it describes the behavioural element between various stakeholders (Cockburn 2000). In addition, the goals of the users characterise the use case in such a manner that the use case demonstrates how the goals can be delivered or might fail (Cockburn 2000). In doing so, the sub-goals are formulated for the system represented by the use case. This approach uses the similar elements of sub-goals and sub-sub-goals for each user goal.

To assist with the management of different levels of user goals, each level is tagged with a label. User goals that are strongly related to the system are called sea-level goals. For example, sending an invoice and placing an order. Sea-level goals belong normally to the primary user for the system and are important because the functions of an information system are usually summarised by a list of the supported sea-level use goals. Other goal levels exist "above" and "below" sea-level: "fish" and "clam" goals are lower level goals, "kite" and "cloud" goals are higher-level goals.

Fish and clam goals refer to single occurrences and describe users' aims that are very specific. Therefore, these types of goals are not typically within the scope of a goal analysis and Cockburn (2002) recommends not to include them. Kite and cloud goals illustrate the context in which the user goals operate and demonstrate the life-cycle sequencing of related goals. In doing so, they define the environment and content of the lower level goals. These goals involve more user deals and what it takes to fulfil them. Examples of cloud goals are "to succeed overall in a company project." Again, they are at the highest abstraction level and therefore are very rarely modelled explicitly (Cockburn 2002).

Although the three approaches are rooted in different research streams they share similar conceptualisations of user goals. Here we present four of these common characteristics:

(a) Goals are interrelated

(b) Goals are layered, there can be sub-goals and/or super-goals

(c) One super-goal can embrace more than one sub-goal

(d) One sub-goal can be part of more than one super-goal

Traditional user acceptance models, such as the one developed by Davis (1998) and Davis et al. (1989), do not explicitly incorporate the layered nature of user goals. These models are focused on one user goal: to enhance talk performance. But analysing the perceived usefulness of IS users without the consideration of various user goals might result in inconsistent and ambiguous assessments of perceived usefulness. The extended research model TAM2 takes a first step towards a relationship of user goals to system acceptance (Venkatesh and Davis 2000). The job relevance of a system is defined as the user's belief to which degree the target system is applicable to his or her job. This perception is based on the mental assessment how the consequences of using a system matches the important work goals of the user. TAM2 assumes that users dispose of knowledge structures that ensure the existence and awareness of various important work goals. Experiences with the system will improve the validity of the users' assessment of the system usage – work goal match.

Prior research demonstrated that users can have different goals for the use of the same system but less work questioned the usefulness of the system to fulfil these different goals. An information system will be perceived as useful for many goals but the degree of usefulness assessment may vary. In respect to the possibility of many user goals on the same goal level, it is likely that the assessment comes up with different levels of usefulness.

The empirical study that is covered in the next section will therefore serve two purposes. The first purpose is to identify different user goals for one information system. We will then look at the assessment of perceived usefulness for each of these goals. Our a priori expectation then is that the level of perceived usefulness will be substantially different when we look at each of these goals. If this is the case, then this finding would confirm the need to have a closer look at user goals before anyone attempts to measure perceived usefulness.

3 METHOD

Our study is a qualitative study that assessed in a two-step approach the perceived usefulness for various goals that users may have.

The Australian website of the shopping and auction platform eBay (http://ebay.com.au) was selected for this study. It is popular and widely used. Further, eBay is a marketplace, which allows the participant to perform different roles, for example buyers, sellers, bidders, and information seekers.

The first step of the study used the technique of one-to-one interviews to detect the goals of users to use the website. In the interviews, we applied the "Laddering Technique" which was developed by Reynolds and Gutman (1988). This technique uses a chain of 'why' questions to make the goals of the user explicit (Reynolds and Gutman 1988). The interviewer started with the question "When did you use eBay for the last time?" and this was followed by many iterations of the questions "Why was that important to you?". These questions were tailored for each participant because the term "it" was replaced with a meaningful expression that linked back to the answers on the previous question. In doing so, the interview questions became increasingly more specific until the user could not think of another reason why something or somebody was important for him or her. The result of these questions is then a "ladder" of goals and motivations. Assuming that a user can have different goals the interviewer then started again with a similar question to the starting one "Can you think of an other time you used eBay and why did you use it at that time?". This allowed the interviewer to build further ladders and this was continued until the user could not think of other goals for using eBay.

For the interviews twelve students in a postgraduate Management Systems course at an Australian university volunteered to participate. Although certainly not representative of a broader population in any way, these students are appropriate participants because they were able to draw on their personal experiences with the website and so could provide us meaningful insight in the ways they found that site useful.

The first step resulted in a collection of 27 user goals, all at varying levels. These goals we used to prepare the second step of the study where a questionnaire was used to assess the perceived usefulness of the website eBay. The questionnaire contained 28 questions. The first question focussed on eBay in general and asked the users to express if eBay is useful, effective, helpful, functional, necessary, and practical. Their answers were measured on a 7-point Likert scale. The measurement items are taken from the utilitarian dimension of the popular HED/UT scale introduced by Voss et al. (2003).

The remaining 27 questions investigated the user's perceptions to which extent they agree or disagree that the website of eBay is useful with respect to each of these user goals. The answers were measured again on a 7-point Likert scale. In addition, we asked the users to explain their answers and give reasons why they assessed the perceived usefulness in that way.

4 RESULTS

This section presents the results of study. First, the hierarchy of user goals is explained. Second, the perceived usefulness assessments are presented; including the overall usefulness of the website and the usefulness assessments for the entire goal hierarchy.

4.1 Hierarchy of User Goals

The hierarchy of goals in Figure 1 represents 27 goals of users of eBay. The hierarchy of goals represents different goals users have while using the website.

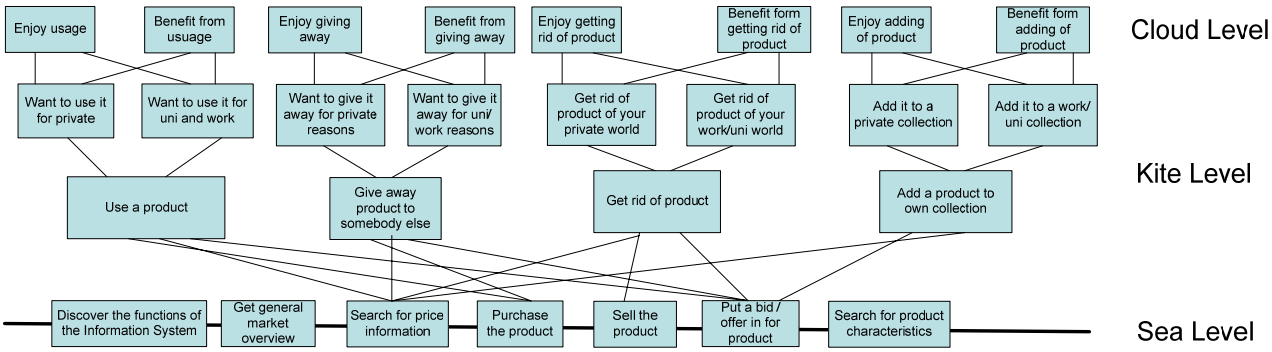

Figure 1. Goal Chart of Users for different motivations using the website eBay.

The hierarchy has three different goal levels which are all related to those put forward by Cockburn (2002) and are sea-level or above.

On the sea-level we could identify seven user goals which can be separated into goals about the information system in general (discovery goal and market overview goal) and business process related goals. Example of discovery and market overview goals are “want to see what eBay is” and ”wanted to find out how much I could get for my old digital camera”. The business process related goals are either goals which deal with product characteristics (price information goal and product characteristics goal) or they refer to the activities conducting a business transaction (buy, sell, bid).

On the next level we defined the kite goals. We found it convenient to conceive of kite levels in two layered levels. The lower kite level goals refer to four different goals that a user can strive for using a shopping website like eBay:

1. Want a product for himself/ herself (e.g. “buy concert tickets”)
2. Want a product for somebody else than me (e.g. “buy a ballet dress for my niece”)
3. Do not want a product any more (e.g. “sell furniture”)
4. Want a product but do not want to ‘use’ it: want it only for its possession: considers the special case of human behaviour as a collector (e.g. “search for and buy diamonds”)

These four goals can be allocated to the goals on a higher kite level. These kite goals distinguishes between two situations that a user can be in: either a private situation, or a work situation. To include both situations we had to split the kite level into more layers. If we retained the original single kite level by Cockburn, that would give us the same four types of goals (to use, to give away, to dispose of, to collect) but it would conceal the expression of the goal environment (private and work).

The cloud goal level contains two types of goals; “having enjoyment” and “benefit from action”. The user used the system to receive enjoyment either by using the new product, by making it as a present, by gaining space for new products, and simply enjoying to enrich collections. Further, the system use can bring various benefits and advantages for the users. Those benefits were expressed, for example, like this: “the new hiking trousers allow me to discover the Australian bush”; “selling the old furniture saves me money because I do not need to move them”. The two types are allocated to the kite goals. Thus, the number of goals a user can have in mind at the highest-abstraction level while using eBay is eight.

4.2 Assessment of the usefulness of the user goals

The evaluation of the website overall (i.e., question 1, a singular assessment of usefulness) was positive. Some variations however exits, which we will discuss further. Table 1 list the means for the overall usefulness and the agreement or disagreement for the five measurement items.

	Mean
Useful	5.75
Effective	5.58
Helpful	5.25
Functional	5.83
Necessary	3.75
Practical	5.42

Table 1. Mean scores for perceived usefulness of the website eBay.com.au. Score between 1 (lowest) and 7 (highest)

Table 2 lists the results of the descriptive statistics and we used them to add the means in the user goal hierarchy (figure 3). Thus, we can see that the different goal level have different usefulness values. Further, we can observe that the usefulness values decrease with the increase of the hierarchy levels.

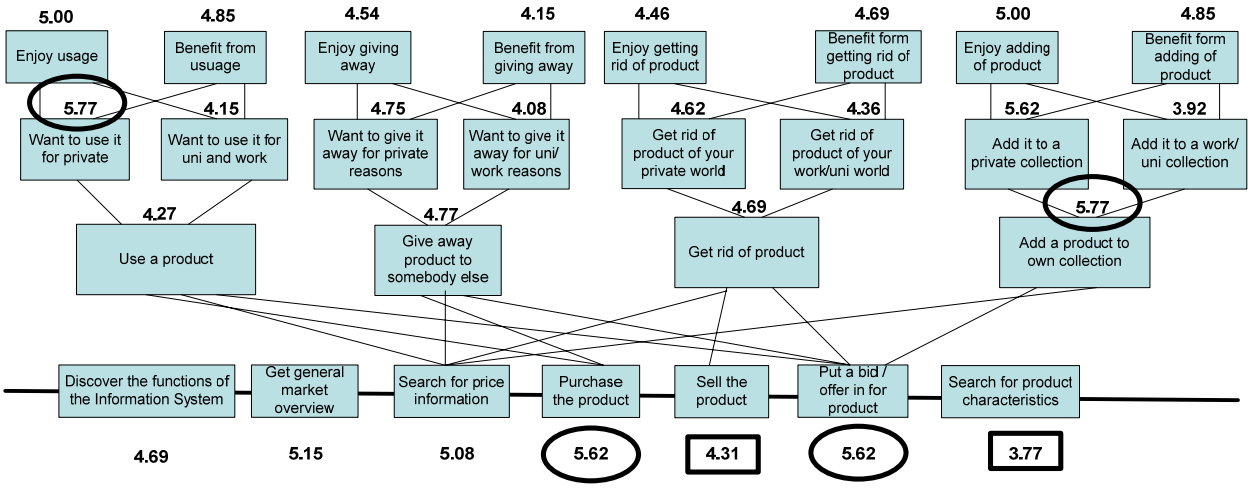

Figure 2. Usefulness measures mapped to the Goal Chart.

The user goals "Purchase the product" and "Put a bid / offer in for product" have the highest usefulness values and the user goal "Search for product characteristics" the lowest value. The user goal "Sell a product" got the second lowest value. All these goals belong to the sea-level.

The goals in the lower kite level are valued between 4.00 and 6.00 and the goal "Add a product to own collection" got the highest usefulness rating. In the above kite level the highest rating moved to the goal "Want to use it for private" however it is followed by the usefulness rating for "Add it to a private collection". The other goals were measured between 3.75 and 5.75.

The goals in the cloud level have been measured between 4.00 and 5.00 and no rating is over 5.0. The ratings for the sea-level goals however are higher: three ratings are above 5.0. If one would compare the usefulness ratings for cloud and sea, it becomes clear that a higher usefulness is perceived by the users for sea level than for the more distant cloud level. The lowest usefulness rating was measured for the sea-level user goal "Search for product characteristics" with 3.77 out of 7 and the highest

usefulness rating was measured for the kite levels “want to use it [a product] for private” and “add a product to own collection” with 5.77 out of 7.

	Min	*Max*	*Mean*	*Std. Deviation*	*Variance*
Usefulness of eBay	4	7	5.77	.73	.53
Effectiveness of eBay	4	7	5.69	.75	.56
Helpfulness of eBay	4	6	5.31	.75	.56
Functionality of eBay	5	7	5.85	.56	.31
Necessity of eBay	1	6	3.69	1.32	1.73
Practicality of eBay	3	7	5.46	1.05	1.10
Discover the functions of Information Systems	2	6	4.69	1.49	2.23
General Market View	4	6	5.15	.80	.64
Search for Price Information	3	6	5.08	.86	.74
Purchase the Product	3	7	5.62	1.12	1.26
Sell the Product	2	6	4.31	1.25	1.56
Put in a bid/offer for the Product	3	7	5.62	1.04	1.09
Search for Product Characteristics	1	7	3.77	1.59	2.53
Use a Product	1	5	4.27	1.19	1.42
Give away a Product to somebody else	1	7	4.77	1.59	2.53
Get rid of a Product	2	6	4.69	1.32	1.73
Add a Product to own collection	4	7	5.77	1.01	1.03
Use the Product for private	4	7	5.77	.83	.69
Use the Product for Uni and work	2	6	4.15	.99	.97
Enjoy usage of a Product	3	6	5.00	1.13	1.27
Benefit from usage of a Product	3	6	4.92	1.17	1.36
Give the Product away for private reasons	3	6	4.75	.97	.93
Give the Product away for Uni and work reasons	2	6	4.08	.86	.74
Enjoy giving away a Product	2	6	4.54	1.45	2.10
Benefit from giving away a Product	1	6	4.15	1.41	1.97
Get rid of a Product from your private world	2	6	4.62	1.26	1.59
Get rid of a Product from your work and Uni world	2	6	4.36	1.29	1.66
Enjoy getting rid of a Product	2	6	4.46	1.20	1.44
Benefit from getting rid of a Product	3	6	4.69	1.11	1.23
Add the Product to a private collection	4	7	5.62	.96	.92
Add a Product to a work and Uni collection	2	6	3.92	1.04	1.08
Enjoy adding a Product	3	7	5.00	1.21	1.46
Benefit from adding a Product	4	6	4.85	.80	.64

Table 1. Descriptive Statistics for goals using eBay.

The following section discusses the findings and emphasises the importance of assessing perceived usefulness in terms of the user goals.

5 DISCUSSION

The paper investigated the assessment of perceived usefulness of users while using an information system. Our research contributes to user acceptance models by taking the implicit user goal of "enhance job performance" from the model and making it variable. This allows users to have different goals for the same system. This research confirms that users have different goals they want to achieve with the information system. 27 different user goals for a particular system were identified, which we found were best conceptualised using four levels. This is not entirely consistent with Cockburn's thee levels. It might be fruitful to consider introducing a new level between 'kite' and 'cloud'. Perhaps a label such as 'air-balloon' or 'plane' or 'zeppelin' might be appropriate.

We then measured the perceived usefulness for all elements in the goal hierarchy. The presented results confirmed that differences for the usefulness assessment for the different goals exist. The main finding from this research is therefore that different user goals on the same level have different levels of usefulness.

Another interesting finding, something we did not expect a priori, is that the *higher* the level of the user goals, the *lower* the perception of usefulness appears to be. Furthermore, the usefulness assessment for the goal "Sell a product" varies quite substantially from the user goals "Purchase a product" and "Put a bid in for a product". The perceived usefulness rating for "selling" is much lower than for "purchasing" and "bidding". We can perhaps explain this by analysing the goals in a bit more detail. In our study, very few respondents used the information system to sell products. The respondents did not have this goal and this may b why eBay is less useful for achieving that goal. The explanations given by the respondents were, for example "Though convenient it is not necessarily the simplest and most risk free method,", "The process to become a seller is more intrusive into personal details."; "It requires constant monitoring of the auction process," and simply "I have not considered this aspect of eBay yet".

The kite level goals demonstrate a variation in the usefulness assessments between the private environment and the work or university environment. If the user goal is related to the private environment, higher usefulness assessments are measured than for goals related to office environments. Prior research on acceptance models tends to focus only on the working environment and does not provide this distinction. In doing so, the assessment of perceived usefulness of eBay would be much lower because of its limitations to the office context. Therefore, the consideration of different goals on different levels allow for a more reliable and precise assessment of perceived usefulness.

The number of participants does not allow us to generalise our findings and it is obvious that a study with a larger sample size would be able to make stronger inferences on how perceived usefulness evaluations would be significantly different for different goal levels. Yet despite the sample size limitation, the empirical study does demonstrate that an a priori identification of the user goals can result in a variety of perceptions of usefulness. This highlights the importance of the concept of the user goal in user acceptance research. It is therefore recommended to conceptualise a variable set of user goals to be introduced in user acceptance research in order for user ratings of usefulness to be more precise, specific, and reliable.

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